

LVDS Interface ICs



# 56bit LVDS Receiver

## 8:56 DeSerializer

### BU7985KVT

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#### ●Description

LVDS Interface IC of ROHM "Serializer" "Deserializer" operate from 8MHz to 150MHz wide clock range, and number of bits range is from 35 to 70. Data is transmitted seven times (7X) stream and reduce cable number by 3(1/3) or less. The ROHM's LVDS has low swing mode to be able to expect further low EMI.

#### ●Features

- Wide dot clock range : Single(112MHz)/Dual(180MHz)(NTSC, VGA, SVGA, WXGA UXGA)
- Support clock frequency from 20MHz up to 112MHz.
- User programmable LVCMOS data output triggering timing  
by using either rising or falling edge of clock.
- User programmable LVCMOS data and clock output driving ability.
- Support Fail-Safe Hi-z Operation.
- 56bit LVDS transmitter is recommended to use BU7988KVT.

#### ●Applications

Flat Panel Display

#### ●Precaution

- This chip is not designed to protect from radioactivity.

Jun.2008

● Block Diagram

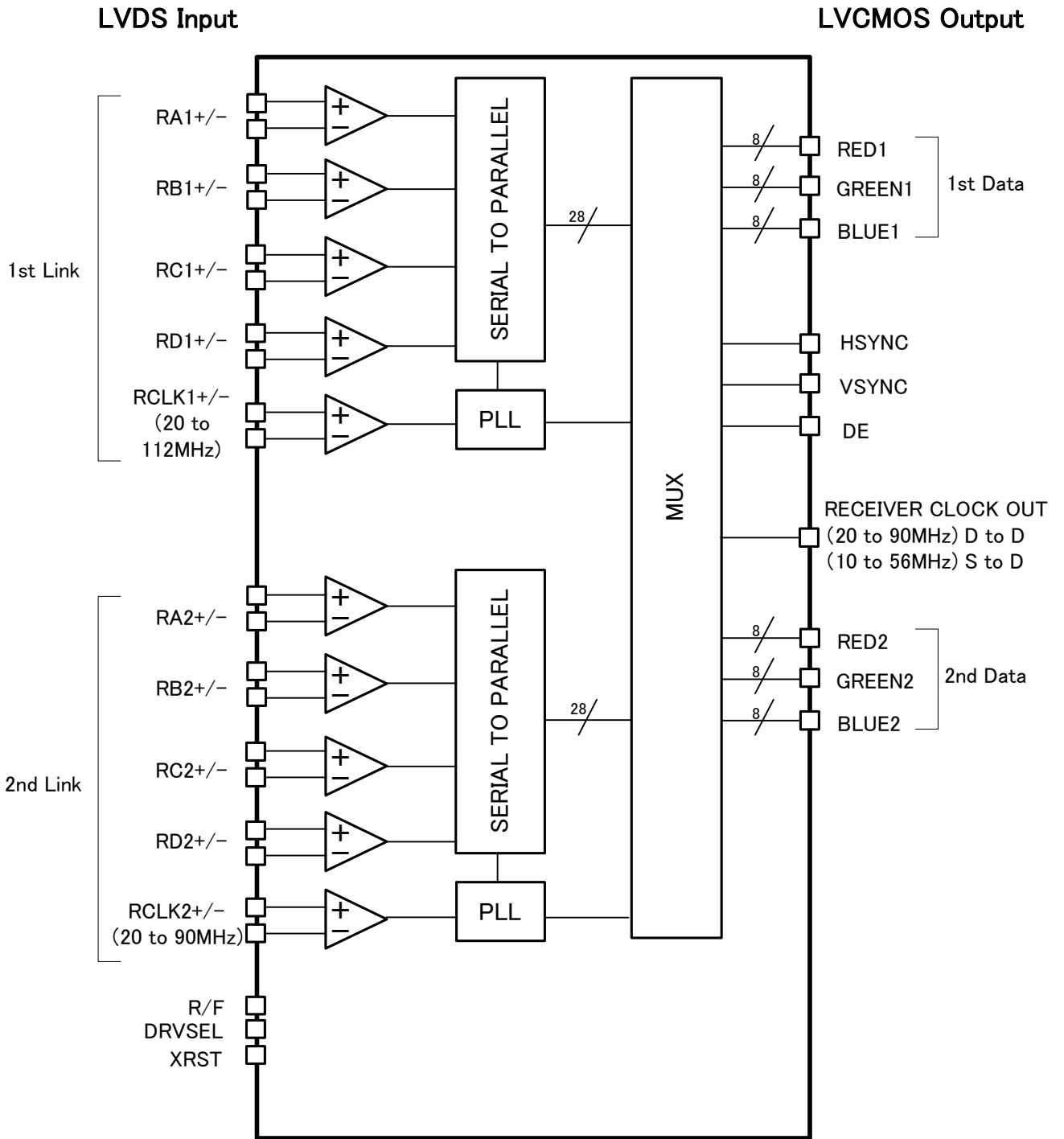


Figure-1 Block Diagram

● TQFP100V Package Outline and Specification

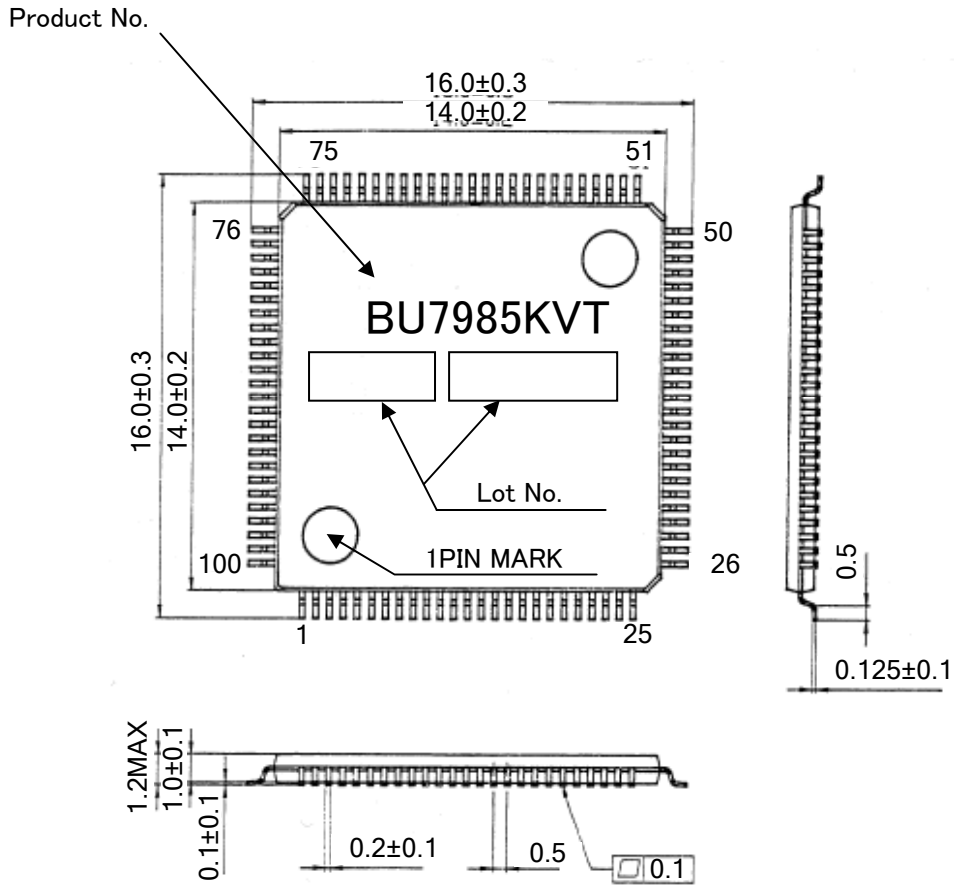


Figure-2 TQFP100V Package Outline and Specification

# ● Pin configuration

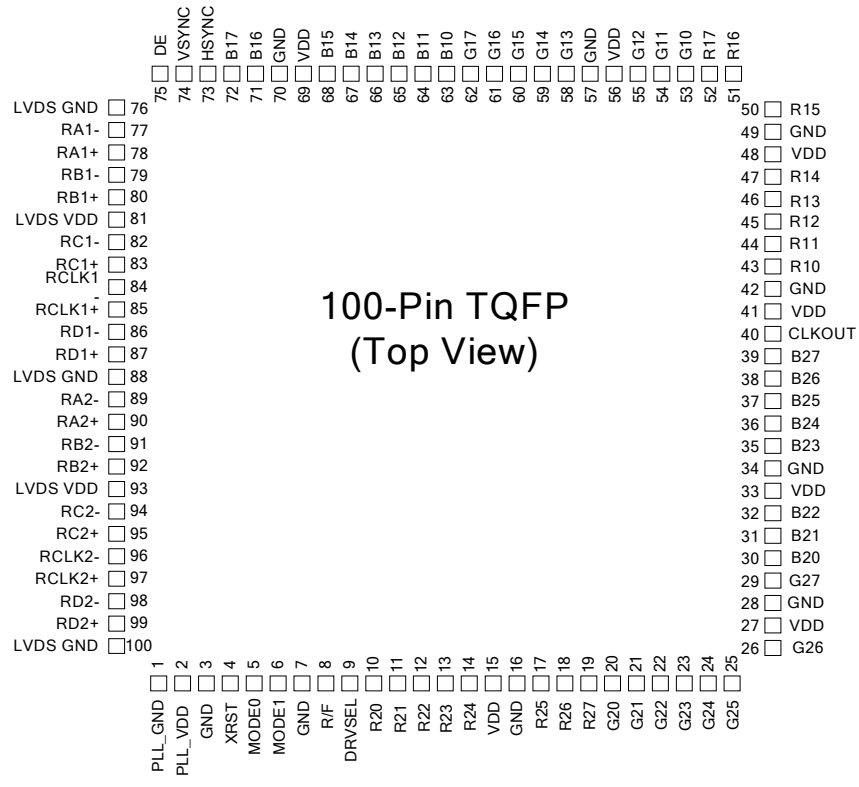


Figure-3 Pin Diagram (Top View)

## ● Pin Description

Table 1 : Pin Description

Pin Name	Pin No.	Type	Descriptions															
RA1+, RA1-	78, 77	LVDS IN	LVDS Data Input for 1st Link. The 1st pixel input data when Dual Link. + : Positive input of LVDS data differential pair. - : Negative input of LVDS data differential pair.															
RB1+, RB1-	80, 79	LVDS IN																
RC1+, RC1-	83, 82	LVDS IN																
RD1+, RD1-	87, 86	LVDS IN																
RCLK1+, RCLK1-	85, 84	LVDS IN	LVDS Clock Input for 1st Link.															
RA2+, RA2-	90, 89	LVDS IN	LVDS Data Input for 2nd Link. These pins are disabled when Single Link. + : Positive input of LVDS data differential pair. - : Negative input of LVDS data differential pair.															
RB2+, RB2-	92, 91	LVDS IN																
RC2+, RC2-	95, 94	LVDS IN																
RD2+, RD2-	99, 98	LVDS IN																
RCLK2+, RCLK2-	97, 96	LVDS IN	LVDS Clock Input for 2nd Link.															
R17 ~ R10	52, 51, 50, 47, 46, 45, 44, 43	OUT	The 1st Pixel Data Outputs.															
G17 ~ G10	62, 61, 60, 59, 58, 55, 54, 53	OUT																
B17 ~ B10	72, 71, 68, 67, 66, 65, 64, 63	OUT																
R27 ~ R20	19, 18, 17, 14, 13, 12, 11, 10	OUT	The 2nd Pixel Data Outputs.															
G27 ~ G20	29, 26, 25, 24, 23, 22, 21, 20	OUT																
B27 ~ B20	39, 38, 37, 36, 35, 32, 31, 30	OUT																
DE	75	OUT	Data Enable Output.															
VSYNC	74	OUT	Vsync Output.															
HSYNC	73	OUT	Hsync Output.															
CLKOUT	40	OUT	Clock Output.															
DRVSEL	9	IN	Output Driverbility Select. L: Data output 2mA / Clock output 4mA H: Data output 4mA / Clock output 8mA															
R/F	8	IN	Output Clock Triggering Edge Select. H: Rising edge, L: Falling edge.															
MODE1,MODE0	6, 5	IN	Pixel Data Mode. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>MODE1</th> <th>MODE0</th> <th>Mode</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>L</td> <td>Dual Link</td> </tr> <tr> <td>L</td> <td>H</td> <td>Single Link</td> </tr> <tr> <td>H</td> <td>L</td> <td>Dual Link With Fail-Safe Hiz</td> </tr> <tr> <td>H</td> <td>H</td> <td>Single Link With Fail-Safe Hiz</td> </tr> </tbody> </table>	MODE1	MODE0	Mode	L	L	Dual Link	L	H	Single Link	H	L	Dual Link With Fail-Safe Hiz	H	H	Single Link With Fail-Safe Hiz
MODE1	MODE0	Mode																
L	L	Dual Link																
L	H	Single Link																
H	L	Dual Link With Fail-Safe Hiz																
H	H	Single Link With Fail-Safe Hiz																

Pin Name	Pin No.	Type	Descriptions
XRST	4	IN	H: Normal operation, L: Power down (all outputs are pulled to ground)
VDD	15, 27, 33, 41, 48, 56, 69	Power	Power Supply Pins for LVCMOS outputs and digital circuitry.
GND	3, 7, 16, 28, 34, 42, 49, 57, 70	Ground	Ground Pins for LVCMOS outputs and digital circuitry.
LVDS VDD	81,93	Power	Power Supply Pins for LVDS inputs.
LVDS GND	76, 88, 100	Ground	Ground Pins for LVDS inputs.
PLL VDD	2	Power	Power Supply Pin for PLL circuitry.
PLL GND	1	Ground	Ground Pin for PLL circuitry.

## ● Electrical characteristics

### ■ Rating

Table 2 : Absolute maximum rating

Item	Symbol	Value		Unit
		Min.	Max.	
Supply voltage	VDD	-0.3	4.0	V
Input voltage	VIN	-0.3	VDD+0.3	V
Output voltage	VOOUT	-0.3	VDD+0.3	V
Storage temperature range	Tstg	-55	125	°C

Table 3 : Package Power

PACKAGE	Power Dissipation (mW)	De-rating (mW/°C)*1
TQFP100V	900	9.0
	1400*2	14.0*2
	2550*2	25.5*2

\*1:At temperature Ta >25°C

\*2:Package power when mounting on the PCB board.

The size of PCB board :70 × 70 × 1.6 (mm<sup>3</sup>) / 140 × 150 × 1.6 (mm<sup>3</sup>)

The material of PCB board : The FR4 glass epoxy board.(3% or less copper foil area)

(It is recommended to apply the above package power requirement to PCB board when the small swing input mode is used)

Table 4 : Recommended Operating Conditions

Parameter	Symbol	Rating			Units	Conditions
		Min	Typ	Max		
Supply Voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	VDD,LVDSVDD,PLLVD
Operating Temperature Range	T <sub>opr</sub>	-20	-	85	°C	

## ■ DC characteristics

**Table 5 : LVCMOS DC Specifications** (VDD=3.0V~3.6V, Ta=-20°C~+85°C)

Symbol	Parameter	Rating			Units	Conditions
		Min	Typ	Max		
V <sub>IH</sub>	High Level Input Voltage	V <sub>DD</sub> × 0.8	-	V <sub>DD</sub>	V	
V <sub>IL</sub>	Low Level Input Voltage	GND	-	V <sub>DD</sub> × 0.2	V	
V <sub>OH</sub>	High Level Output Voltage	2.4	-	V <sub>DD</sub>	V	I <sub>OH</sub> = -2mA, -4mA (data) I <sub>OH</sub> = -4mA, -8mA (clock)
V <sub>OL</sub>	Low Level Output Voltage	0.0	-	0.4	V	I <sub>OL</sub> = 2mA, 4mA (data) I <sub>OL</sub> = 4mA, 8mA (clock)
I <sub>INC</sub>	Input Leak Current	-10	-	+10	μA	0V ≤ V <sub>IN</sub> ≤ V <sub>DD</sub>
I <sub>OZ</sub>	Output Leak Current	-10	-	+10	μA	Output=Hiz, 0V ≤ V <sub>OUT</sub> ≤ V <sub>DD</sub>

**Table 6 : LVDS Receiver DC Specifications** (VDD=3.0V~3.6V, Ta=-20°C~+85°C)

Symbol	Parameter	Rating			Units	Conditions
		Min	Typ	Max		
V <sub>TH</sub>	Differential Input High Threshold	-	-	100	mV	V <sub>OC</sub> =1.2V
V <sub>TL</sub>	Differential Input Low Threshold	-100	-	-	mV	V <sub>OC</sub> =1.2V
I <sub>INL</sub>	Input Current	-20	-	+20	μA	V <sub>IN</sub> =2.4V/0V V <sub>DD</sub> =3.6



## ■ Supply Current

Table 7 : Supply Current (VDD=3.3V, Ta=25°C)

Symbol	Parameter	Rating			Units	Conditions	
		Min	Typ	Max			
I <sub>RCCG</sub>	Receiver supply current (Gray scale pattern)	-	88	-	mA	MODE[1:0]=L L, H L CL=8pF	f=90MHz
		-	62	-	mA	MODE[1:0]=L H, H H CL=8pF	f=112MHz
I <sub>RCCW</sub>	Receiver supply current (Checker pattern)	-	137	-	mA	MODE[1:0]=L L, H L CL=8pF	f=90MHz
		-	89	-	mA	MODE[1:0]=L H, H H CL=8pF	f=112MHz
I <sub>RCCS</sub>	Receiver Power Down Supply Current	-	-	10	μA	XRST=L	

## 256 Gray Scale Pattern

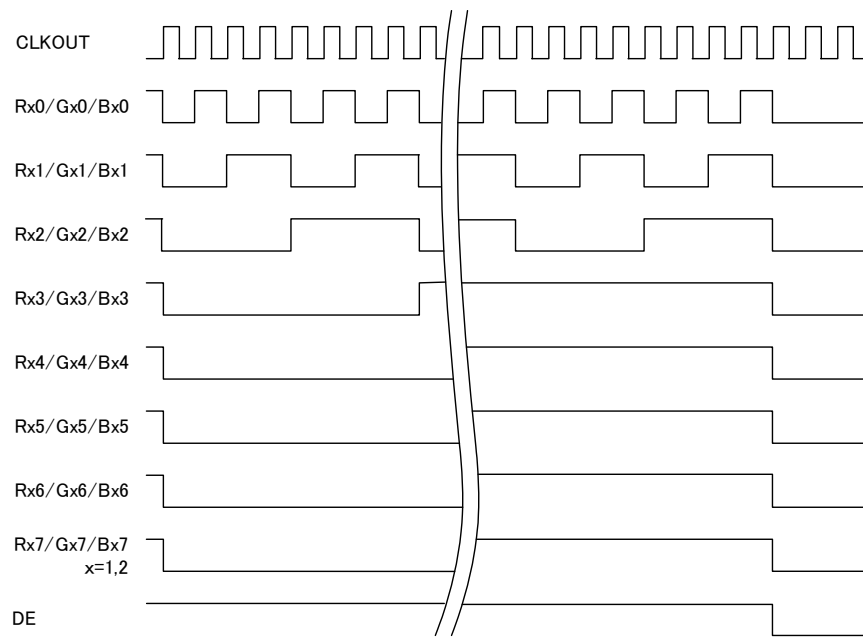


Figure-4 Gray scale pattern

## Double Checker Pattern

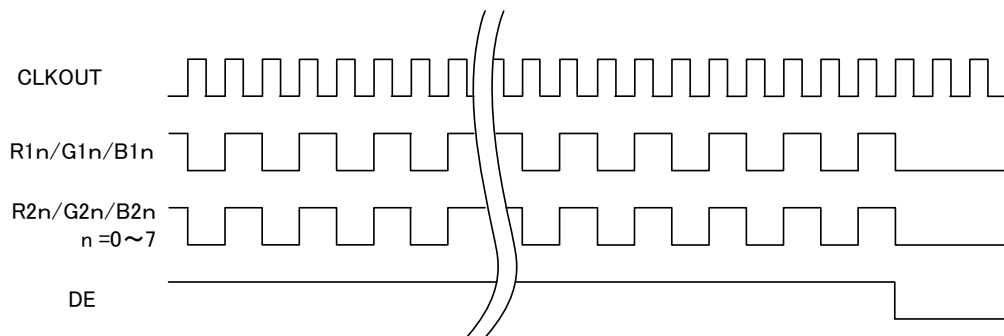


Figure-5 Checker pattern

## ■ AC characteristics

**Table 8 : Switching Characteristics** (VDD=3.0V~3.6V, Ta=-20°C~+85°C)

Symbol	Parameter	Min	Typ	Max	Units	
$t_{RCP}$	CLK OUT Period	Dual-in / Dual-out	11.11	$t_{RCIP}$	50	ns
		Single-in / Dual-out	17.85	$2t_{RCIP}$	100	
$t_{RCH}$	CLKOUT High Time	-	$0.5t_{RCP}$	-	ns	
$t_{RCL}$	CLKOUT Low Time	-	$0.5t_{RCP}$	-	ns	
$t_{RS}$	LVC MOS Data Setup to CLKOUT	$0.3t_{RCP}$	-	-	ns	
$t_{RH}$	LVC MOS data hold from CLKOUT	$0.3t_{RCP}$	-	-	ns	
$t_{TLH}$	LVC MOS Low to High Transition Time	-	3.0	5.0	ns	
$t_{THL}$	LVC MOS Low to Low Transition Time	-	3.0	5.0		
$t_{RIP1}$	Input Data Position0 ( $T_{RCIP} = 8.9ns$ )	-0.25	0.0	+0.25	ns	
$t_{RIP0}$	Input Data Position1 ( $T_{RCIP} = 8.9ns$ )	$\frac{t_{RCIP}}{7} - 0.25$	$\frac{t_{RCIP}}{7}$	$2\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{RIP6}$	Input Data Position2 ( $T_{RCIP} = 8.9ns$ )	$2\frac{t_{RCIP}}{7} - 0.25$	$2\frac{t_{RCIP}}{7}$	$2\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{RIP5}$	Input Data Position3 ( $T_{RCIP} = 8.9ns$ )	$3\frac{t_{RCIP}}{7} - 0.25$	$3\frac{t_{RCIP}}{7}$	$3\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{RIP4}$	Input Data Position4 ( $T_{RCIP} = 8.9ns$ )	$4\frac{t_{RCIP}}{7} - 0.25$	$4\frac{t_{RCIP}}{7}$	$4\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{TOP3}$	Input Data Position5 ( $T_{RCIP} = 8.9ns$ )	$5\frac{t_{RCIP}}{7} - 0.25$	$5\frac{t_{RCIP}}{7}$	$5\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{RIP2}$	Input Data Position6 ( $T_{RCIP} = 8.9ns$ )	$6\frac{t_{RCIP}}{7} - 0.25$	$6\frac{t_{RCIP}}{7}$	$6\frac{t_{RCIP}}{7} + 0.25$	ns	
$t_{RRLL}$	Phase Lock Loop Set	-	-	10.0	ms	
$t_{RCIP}$	CLKIN Period	8.9	-	50	ns	
$t_{ck12}$	Skew Time between RCLK1 and RCLK2	-	-	$\pm 0.3t_{RCIP}$	ns	

## ● AC Timing

### ■ LVCMOS

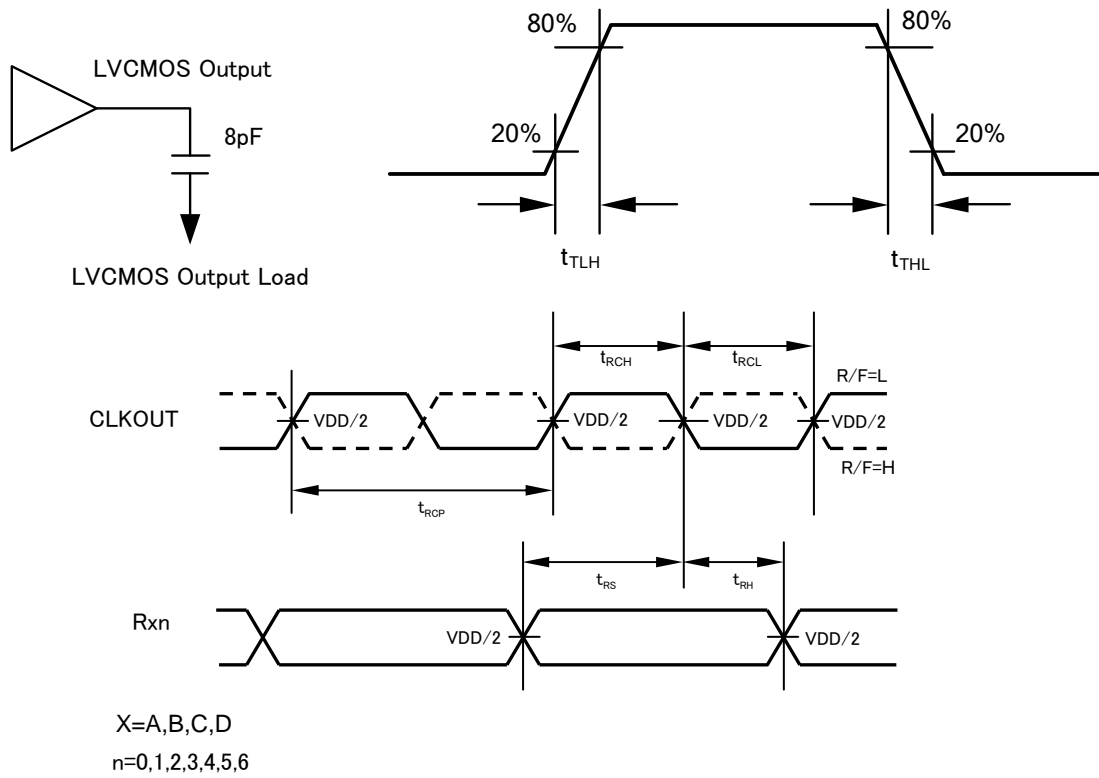


Figure-6 LVCMOS output timing

### ■ Phase-locked loops set time

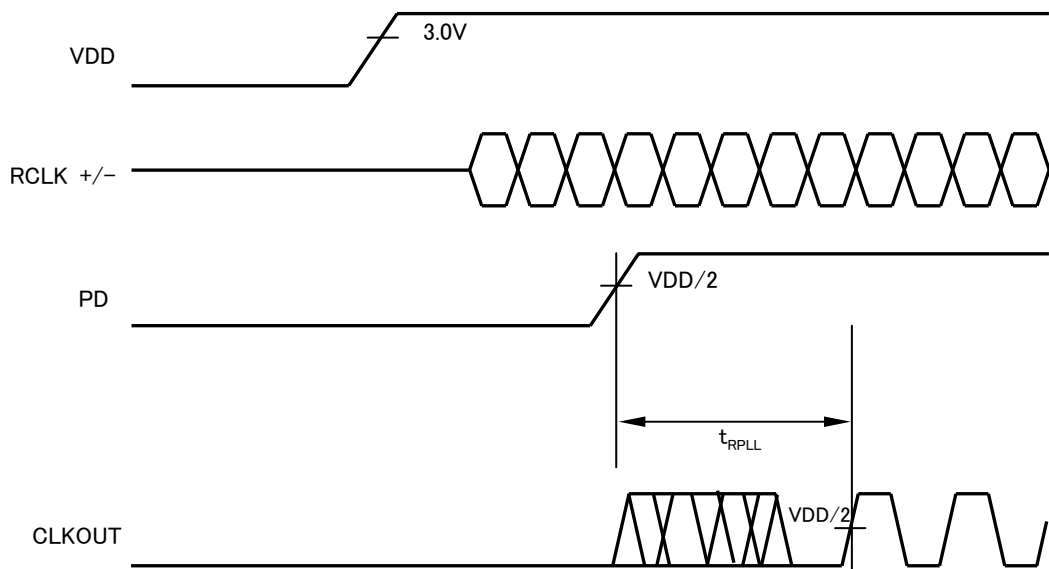


Figure-7 Phase-locked loops set time

## ■ AC Timing Diagrams

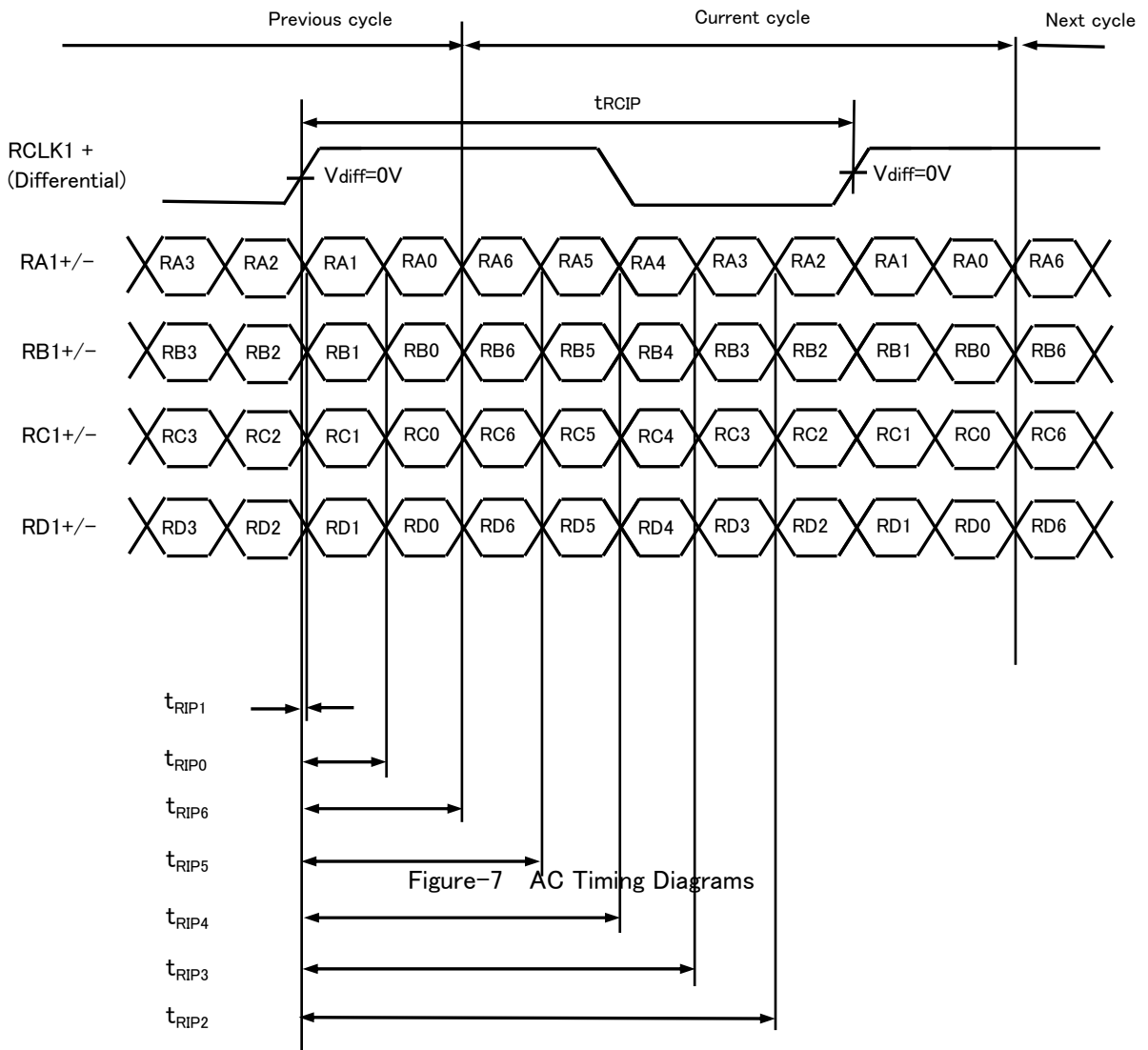
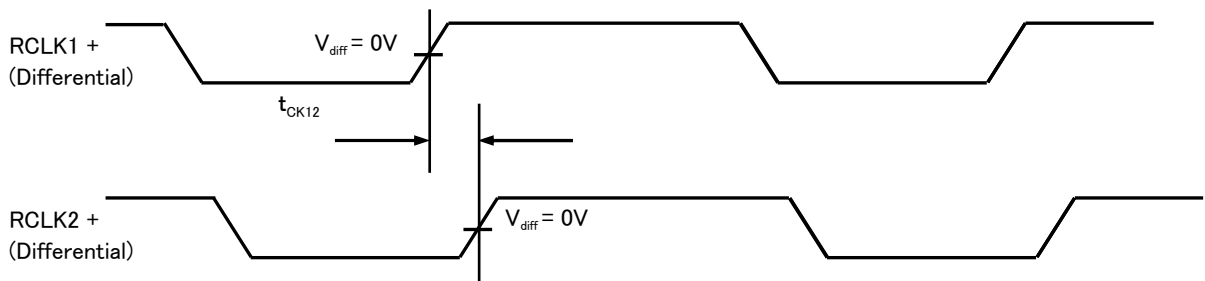


Figure-8 LVDS data and clock input timing



Note :  $V_{diff}=(R_{yx+})-(R_{yx-}), (RCLKx+)-(RCLKx-),$

● LVDS Data, Clock Input and Output Timing

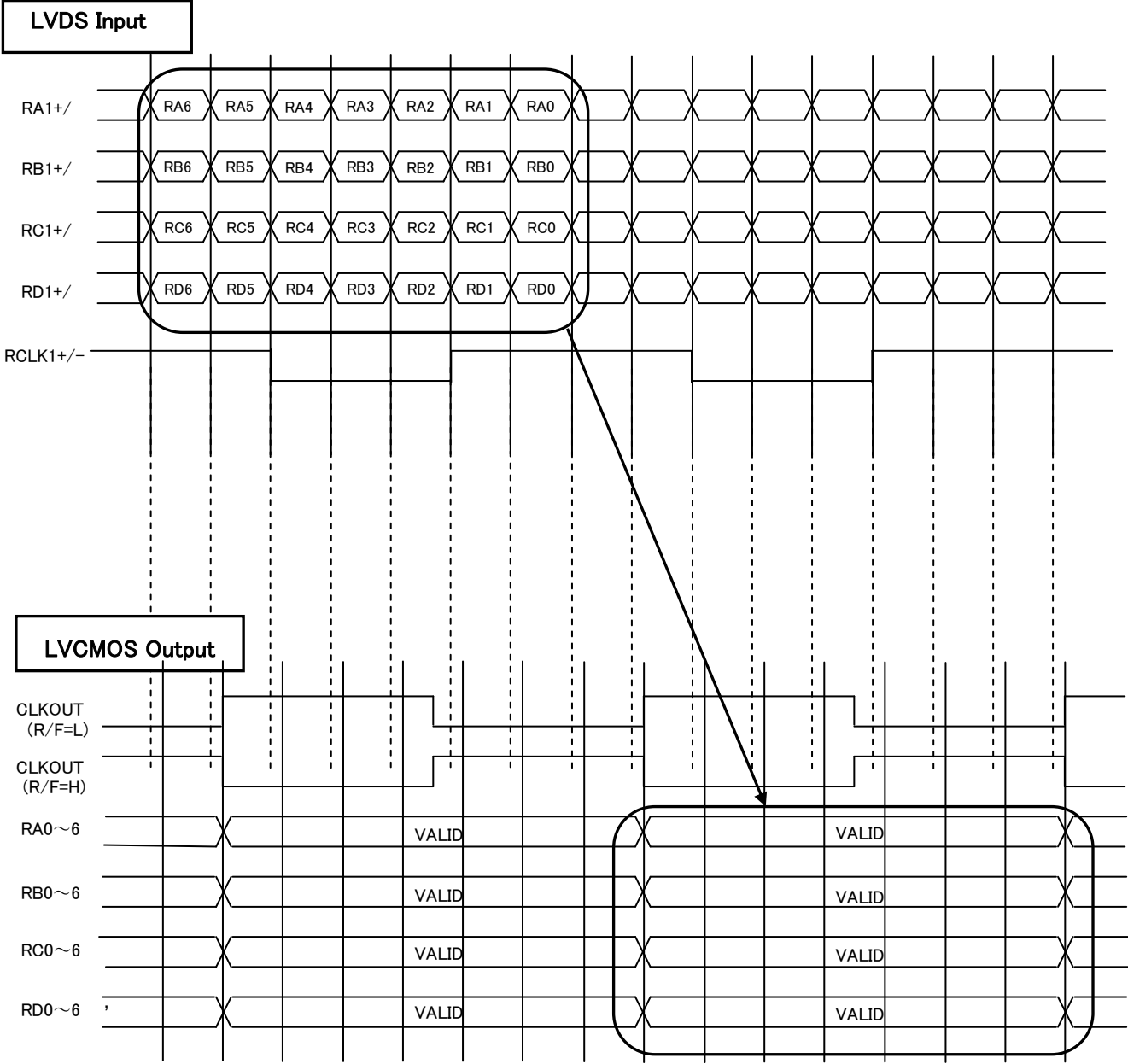


Figure-9 LVDS Data, Clock Input and Output Timing

● Pixel Map Table for Dual Link

Table 9: Pixel Map

1st Pixel Data				2nd Pixel Data			
TFT Panel Data			BU7985KVT LVCMOS Output Pin	TFT Panel Data			BU7985KVT LVCMOS Output Pin
	24Bit	18Bit			24Bit	18Bit	
LSB	R10	–	R10	LSB	R20	–	R20
	R11	–	R11		R21	–	R21
	R12	R10	R12		R22	R20	R22
	R13	R11	R13		R23	R21	R23
	R14	R12	R14		R24	R22	R24
	R15	R13	R15		R25	R23	R25
	R16	R14	R16		R26	R24	R26
MSB	R17	R15	R17	MSB	R27	R25	R27
LSB	G10	–	G10	LSB	G20	–	G20
	G11	–	G11		G21	–	G21
	G12	G10	G12		G22	G20	G22
	G13	G11	G13		G23	G21	G23
	G14	G12	G14		G24	G22	G24
	G15	G13	G15		G25	G23	G25
	G16	G14	G16		G26	G24	G26
MSB	G17	G15	G17	MSB	G27	G25	G27
LSB	B10	–	B10	LSB	B20	–	B20
	B11	–	B11		B21	–	B21
	B12	B10	B12		B22	B20	B22
	B13	B11	B13		B23	B21	B23
	B14	B12	B14		B24	B22	B24
	B15	B13	B15		B25	B23	B25
	B16	B14	B16		B26	B24	B26
MSB	B17	B15	B17	MSB	B27	B25	B27
	HSYNC	HSYNC	HSYNC		HSYNC	HSYNC	HSYNC
	VSYNC	VSYNC	VSYNC		VSYNC	VSYNC	VSYNC
	DE	DE	DE		DE	DE	DE

● CMOS Data Output Timing for Dual Link

Example : SXGA+(1400 × 1050)

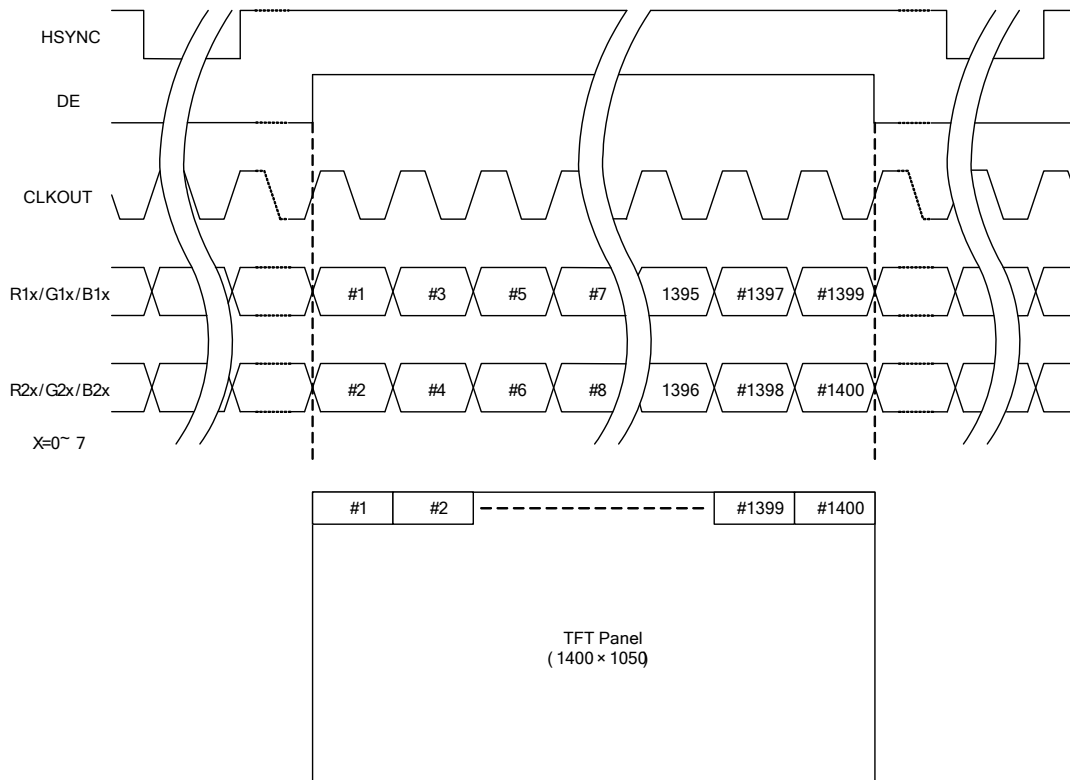


Figure-10 Data Output Timing for Dual Link

● CMOS Data Output Timing for Single Link

Example : SXGA+(1400 × 1050)

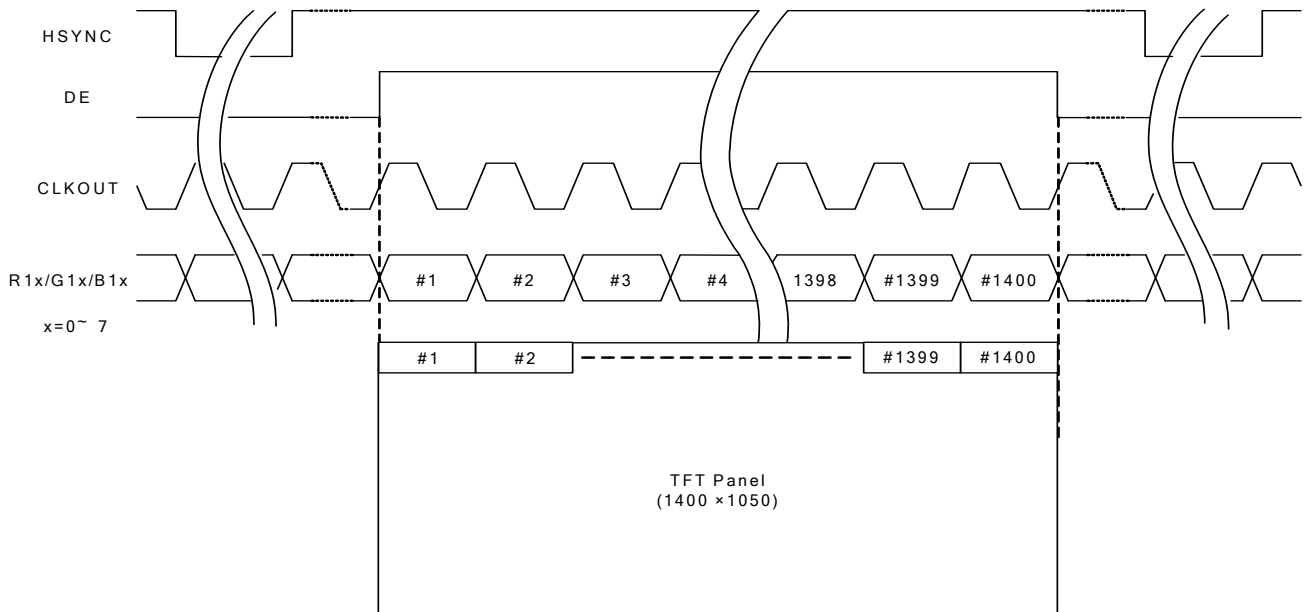


Figure-11 Data Output Timing for Dual Link



● LVDS Data Inputs Timing Diagrams in Dual Link  
(Dual-in / Dual-out Mode)

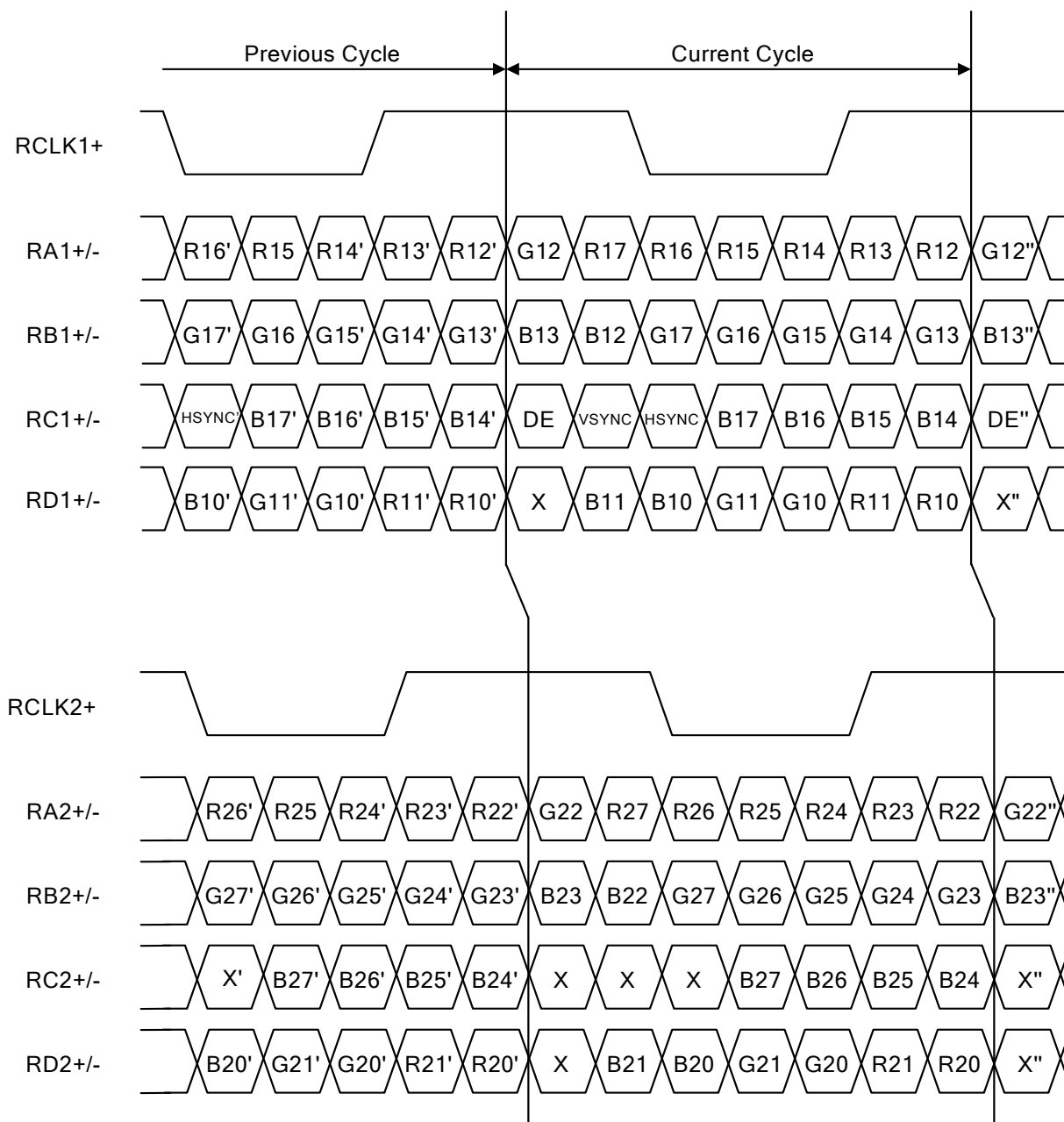


Figure-12 Data Input Timing for Dual Link

● **LVDS Data Inputs Timing Diagrams in Single Link**  
**(Single-in / Dual-out Mode)**

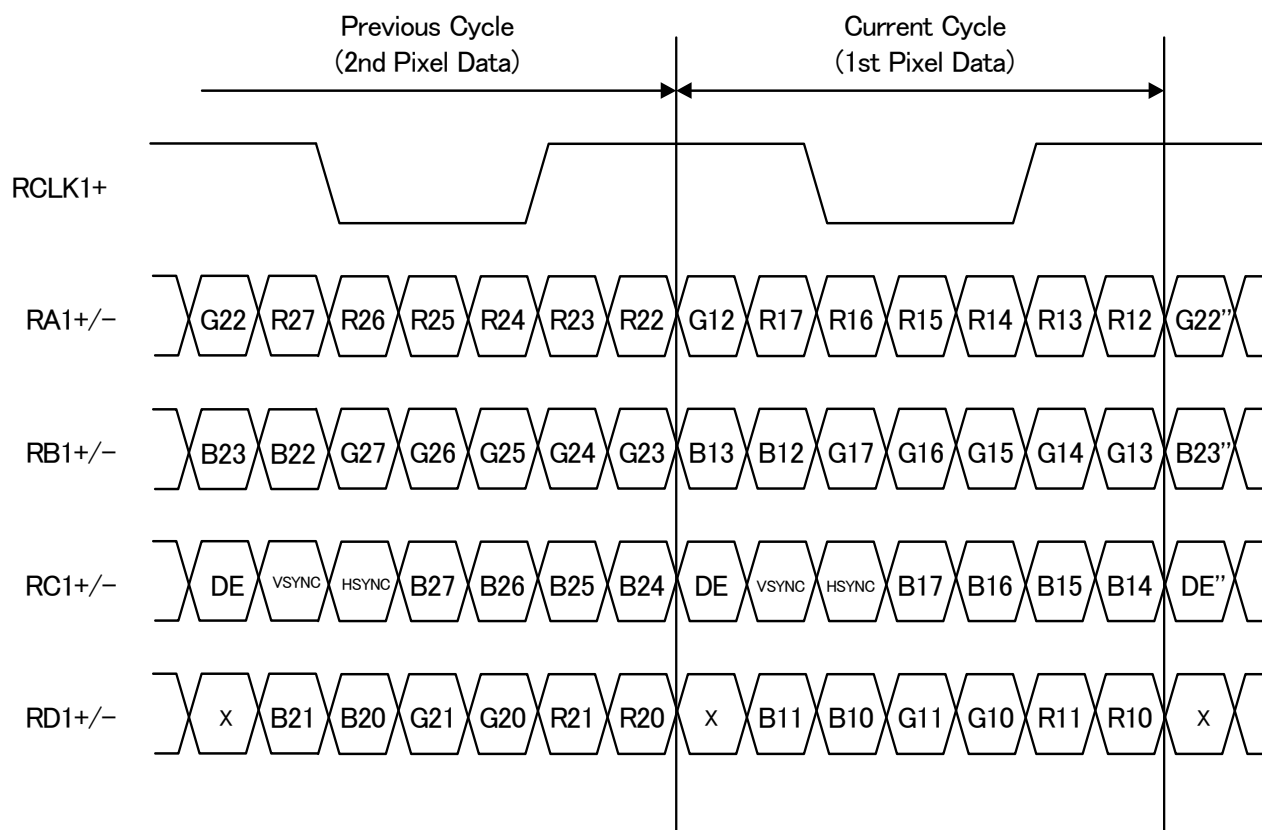


Figure-13 Data Input Timing for Single Link

● **Fail-Safe Hi-Z Operation**

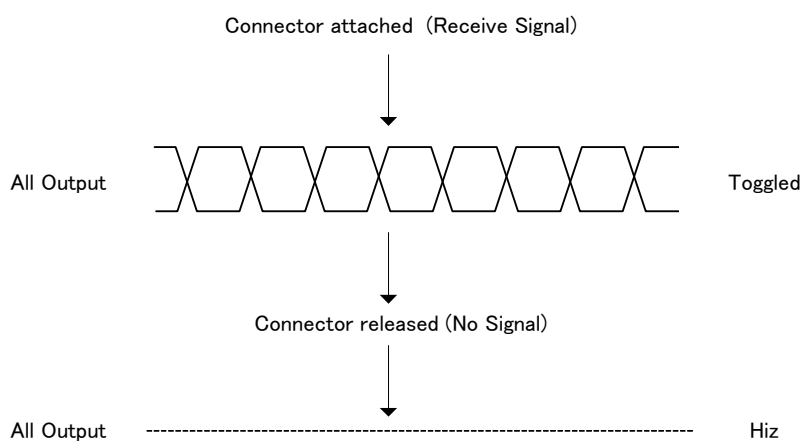


Figure-14 Fail-Sage Hi-Z Operation

## ●About the Power On Reset

Power On Reset is not mandatory for this device.

(The PD pin should be set to high level when Power On Reset procedure is not used.)

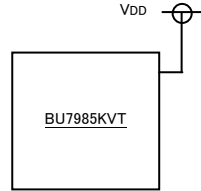


Figure-9 Terminal connection when Power On Reset is not used

However, Power On Reset procedure is strongly recommend for internal logic initialization by following two methods.

- ① The method of using CR circuit.
- ② The method of using external specific IC.

It is recommend to do enough examination for target application.

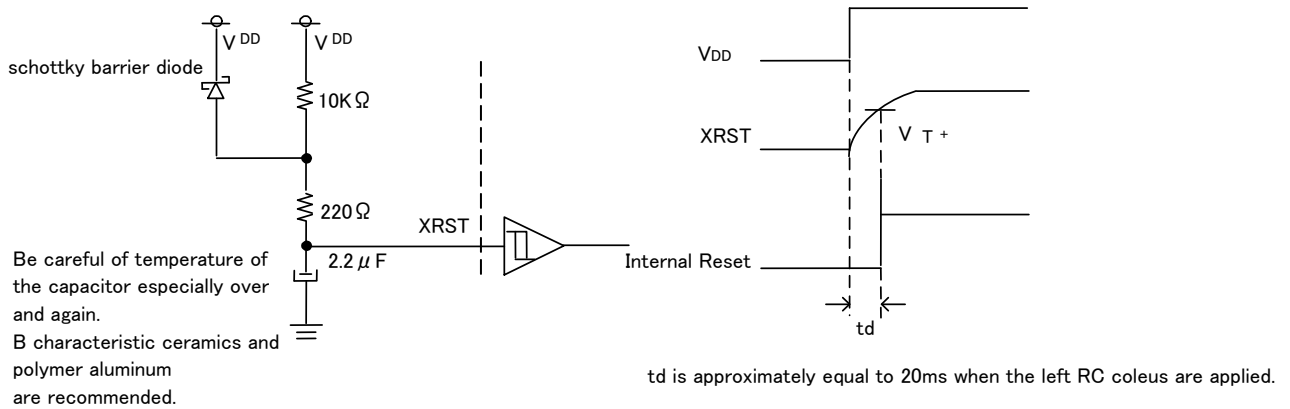


Figure-15 Power On Reset by external a CR circuit

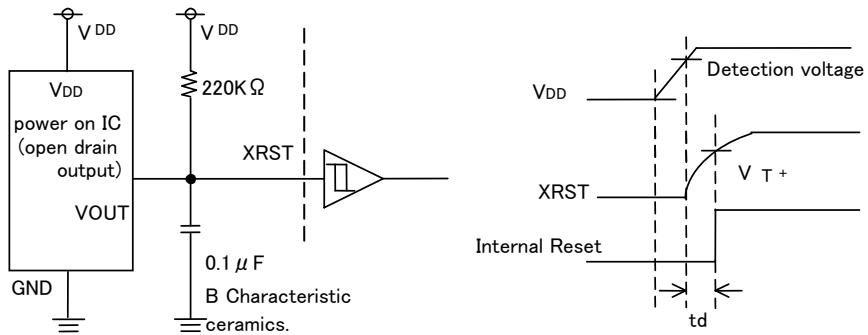
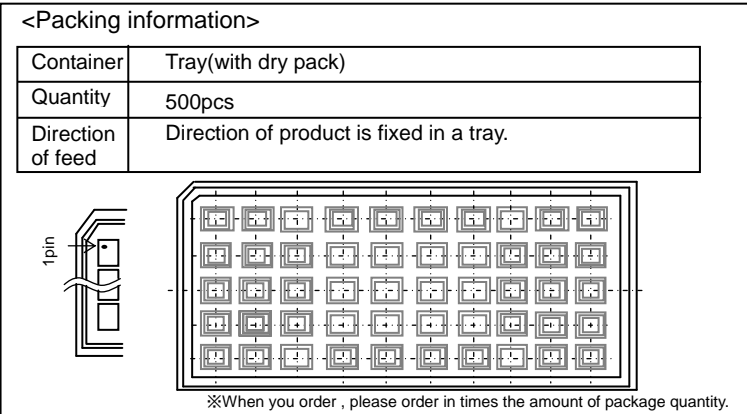
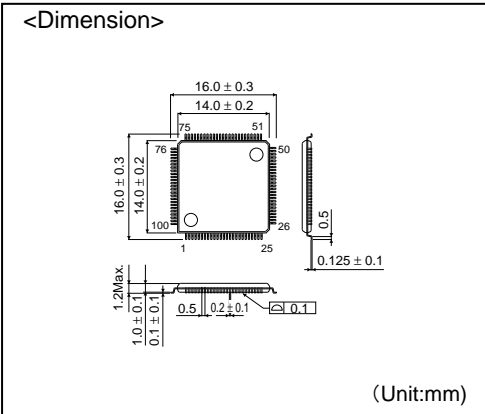


Figure-16 Power On Reset by specific IC

# TQFP100V



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- The products described herein are not designed to be X ray proof.

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Contact us for further information about the products.

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